

VALUATION

FIFTH EDITION

Instructors:

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Chapter 6

Frameworks for Valuation:
Enterprise DCF and Discounted Economic Profit Models

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Using DCF to Value Companies

- There are five well-known frameworks for valuing a company using discounted flows, the most common being enterprise discounted cash flow (DCF).
- In theory, each framework will generate the same value. In practice, the ease of implementation and the interpretation of results varies across frameworks.
- In this presentation, we examine how to value a company using enterprise DCF and discounted economic profit.

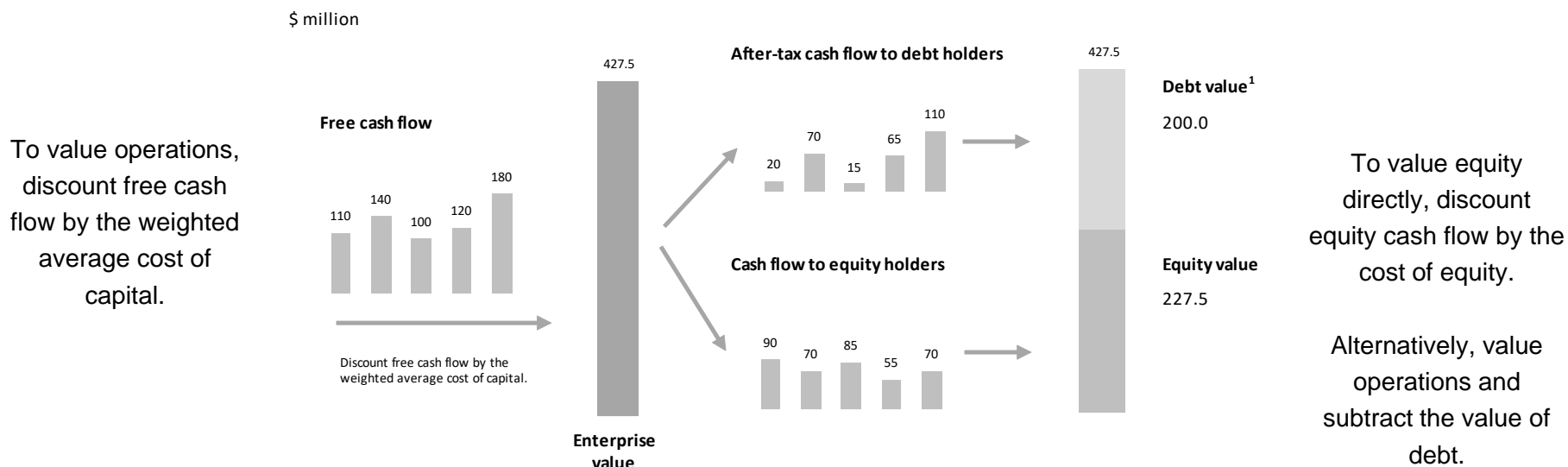
Frameworks for Valuation

Model	Measure	Discount factor	Assessment
Enterprise discounted cash flow	Free cash flow	Weighted average cost of capital	Works best for projects, business units, and companies that manage their capital structure to a target level.
Discounted economic profit	Economic profit	Weighted average cost of capital	Explicitly highlights when a company creates value.
Adjusted present value	Free cash flow	Unlevered cost of equity	Highlights changing capital structure more easily than WACC-based models.
Capital cash flow	Capital cash flow	Unlevered cost of equity	Compresses free cash flow and the interest tax shield in one number, making it difficult to compare operating performance among companies and over time.
Equity cash flow	Cash flow to equity	Levered cost of equity	Difficult to implement correctly because capital structure is embedded within the cash flow. Best used when valuing financial institutions.

Valuing the Enterprise versus Financial Claims

- To value a company, you can either value the cash flows generated by the company's economic assets or value each financial claim separately (debt equity, other financial claims, etc.).

Enterprise Valuation of a Single-Business Company



¹ Debt value equals discounted after-tax cash flow to debt holders plus the present value of interest tax shield.

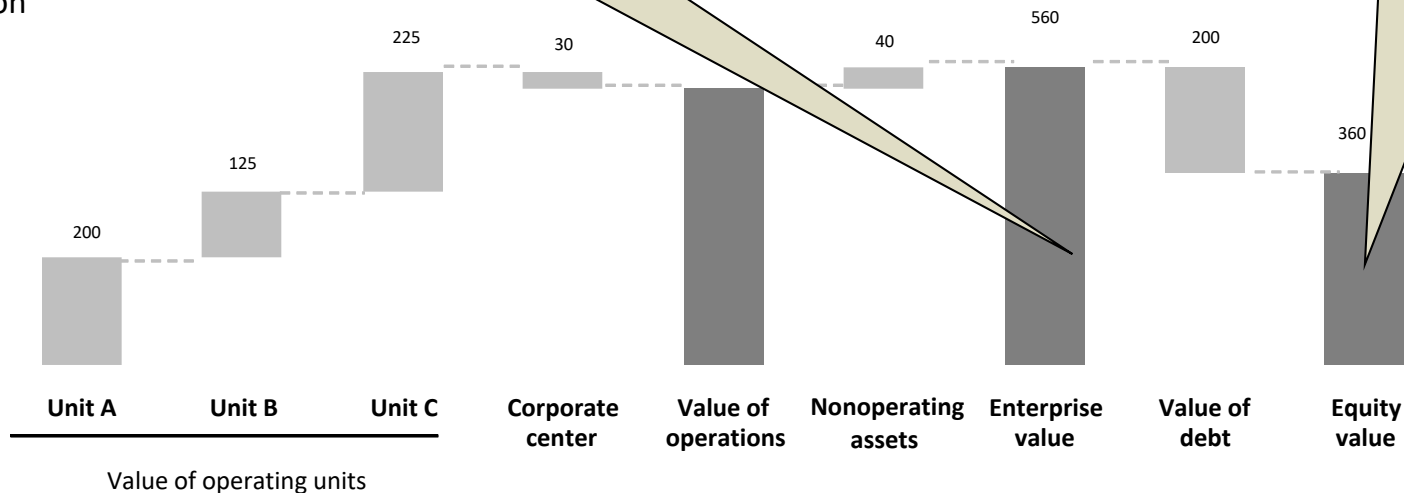
Defining Enterprise Value versus Equity Value

Enterprise value equals the value of operations (core businesses) and nonoperating assets, such as excess cash.

A company's equity value can be computed indirectly by calculating enterprise value first and then subtracting any nonequity claims, such as debt.

Enterprise Valuation of a Multibusiness Company

\$ million



The Valuation Process Using Enterprise DCF

Valuation is an iterative process...

6. Calculate and Interpret Results

Once the model is complete, examine valuation results to ensure your findings are technically correct, your assumptions are realistic, and your interpretations are plausible.

5. Enterprise Value to Equity Value

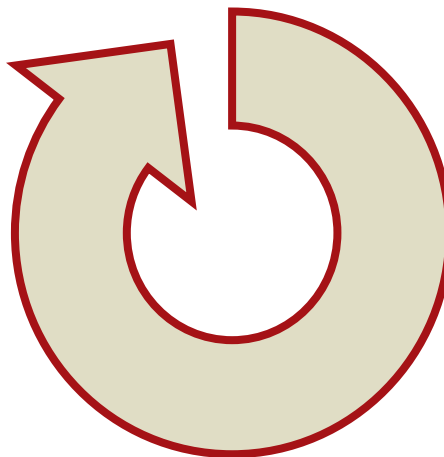
To convert enterprise value into equity value, subtract any nonequity claims, such as debt, unfunded retirement liabilities, capitalized operating leases, and outstanding employee options.

4. Compute the Cost of Capital

To value the enterprise, free cash flow is discounted by the weighted average cost of capital. The cost of capital is the blended rate of return for all sources of capital, specifically debt and equity.

1. Analyze Historical Performance

By thoroughly analyzing the past, we can document whether the company has created value, whether it has grown, and how it compares with its competitors.



2. Forecast Financials and Cash Flows

Project financials over the short and medium term. Short-term forecasts should be consistent with announced operating plans. Medium-term forecasts should focus on operating drivers, such as margins, and on capital turnover.

3. Estimate a Continuing Value

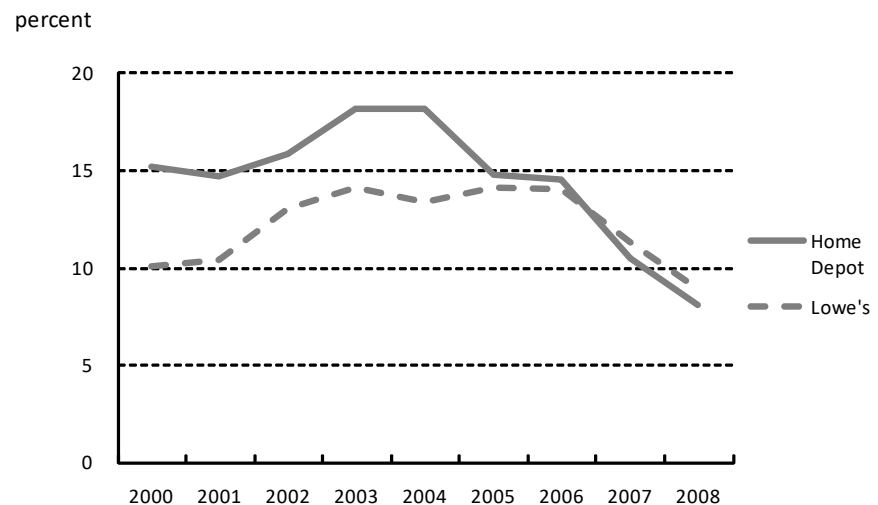
To forecast cash flows in the long-term future, use a perpetuity that focuses on the company's key value drivers, specifically ROIC and growth.

1. Analyze Historical Performance: Analyzing ROIC

Analyze Historical Performance

- Before projecting future cash flow, examine the company's historical performance. A good analysis focuses on the key drivers of value: return on invested capital (ROIC) and growth. ROIC measures a company's ability to create value.
- Both Home Depot and Lowe's have struggled to maintain ROIC in recent years. Home Depot no longer enjoys a performance advantage over Lowe's.

Home Depot and Lowe's Return on Invested Capital



¹ROIC measured with goodwill and acquired intangibles. Goodwill and acquired intangibles do not meaningfully affect ROIC for either company.

How do we compute ROIC?

Analyze Historical Performance: Computing ROIC

Home Depot and Lowe's: Historical ROIC Analysis

\$ million

	Home Depot			Lowe's		
	2006	2007	2008	2006	2007	2008
Net sales	90,837	77,349	71,288	46,927	48,283	48,230
Cost of merchandise sold	(61,054)	(51,352)	(47,298)	(30,729)	(31,556)	(31,729)
Selling, general, and administrative	(18,348)	(17,053)	(17,846)	(9,884)	(10,656)	(11,176)
Depreciation	(1,645)	(1,693)	(1,785)	(1,162)	(1,366)	(1,539)
Add: Operating lease interest	441	536	486	185	169	199
Adjusted EBITA	10,231	7,787	4,845	5,337	4,874	3,985
Operating cash taxes	(3,986)	(3,331)	(1,811)	(2,071)	(1,973)	(1,496)
NOPLAT	6,245	4,456	3,033	3,266	2,901	2,489
Invested Capital						
Operating working capital	4,556	3,490	3,490	1,725	1,792	2,084
Net property and equipment	26,605	27,476	26,234	18,971	21,361	22,722
Capitalized operating leases	9,141	7,878	8,298	3,034	3,528	3,913
Other operating assets, net of operating liabilities	(1,027)	(1,635)	(2,129)	(126)	(461)	(450)
Invested capital (excluding goodwill) ¹	39,275	37,209	35,893	23,604	26,220	28,269
Goodwill and acquired intangibles	7,092	1,309	1,134	-	-	-
Cumulative amortization and unreported goodwill	177	49	49	730	730	730
Invested capital (including goodwill)	46,543	38,567	37,075	24,334	26,950	29,000
ROIC excluding goodwill (average) ¹	16.7%	11.7%	8.3%	14.5%	11.6%	9.1%
ROIC including goodwill (average) ¹	14.5%	10.5%	8.0%	14.0%	11.3%	8.9%

¹Goodwill includes goodwill, acquired intangibles, cumulative amortization, and unreported goodwill.

ROIC is computed by comparing after-tax operating profits to invested capital

NOPLAT

After-tax operating profit equals revenues minus operating costs, less any taxes that would have been paid if the firm held only core assets and was financed only with equity.

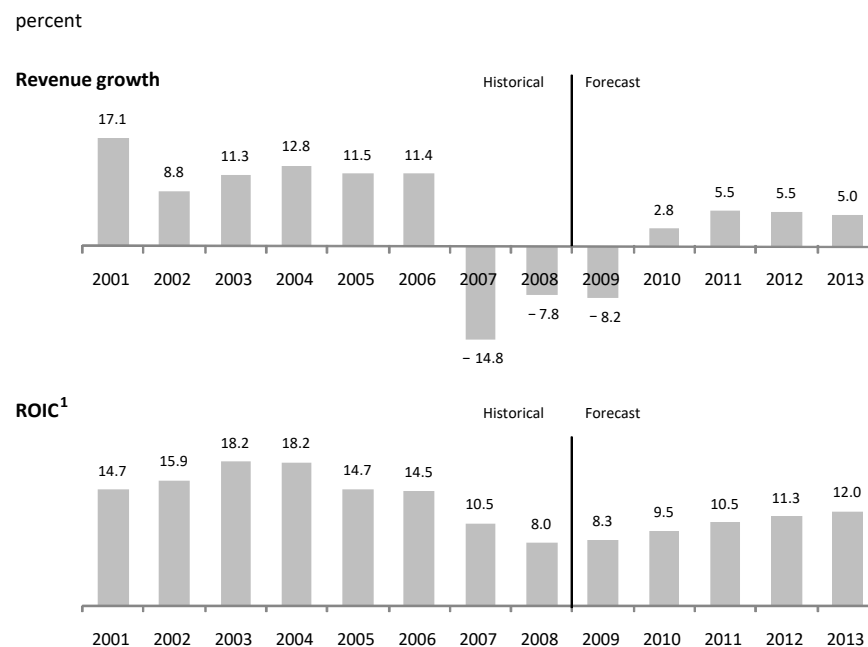
Invested Capital

Invested capital equals the operating assets required for core business activities (such as inventory and PP&E) less any financing provided by customers, employees, and suppliers (such as accounts payable).

2. Forecast Financials: Growth and ROIC

- To compute a company's value using enterprise DCF, future free cash flow is discounted by the weighted average cost of capital. Rather than forecast FCF directly, however, forecast the financials that drive free cash flow.
- To value Home Depot, we looked to consensus analyst forecasts. Note that neither revenue growth nor ROIC is expected to return to its pre-2007 levels.

Home Depot: Projected Revenue Growth and ROIC

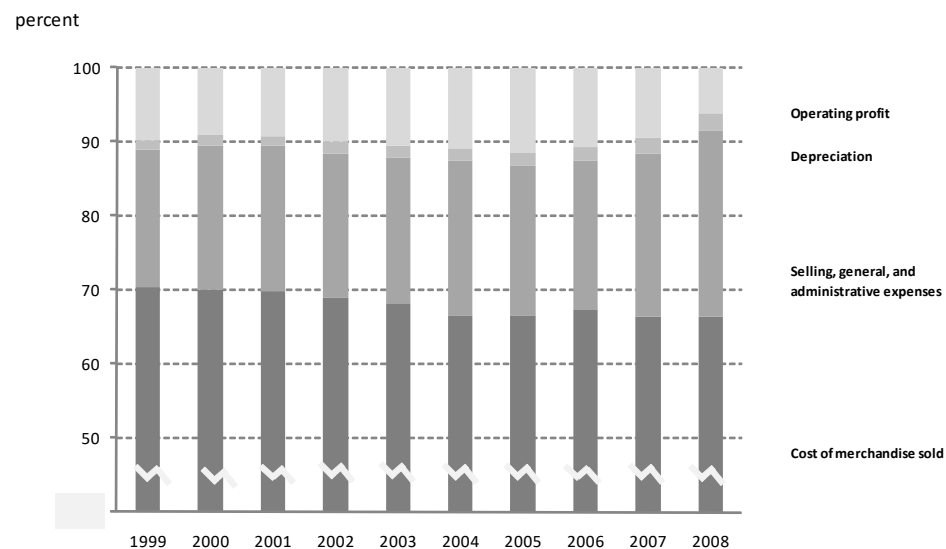


¹ROIC measured using average invested capital

Forecast Financials: Digging Deeper

- During his tenure, Home Depot CEO Bob Nardelli focused the organization on using economies of scale to reduce cost of merchandise. This led to a 2 percent increase in operating margin.
- In 2007, new CEO Frank Blake stated he would make improved customer service a core strategy. As a result, profitability dropped as selling expenses increased from 20 percent to 24 percent of revenue.
- A reliable estimate of sustainable sales expenses is critical for an accurate assessment of enterprise value based on future cash flow.

Home Depot: Operating Margin Analysis



Note: SG&A and operating profit adjusted for operating leases.

Forecast Financials: Free Cash Flow

- Free cash flow, which is driven by revenue growth and return on invested capital, provides the basis for enterprise DCF valuation.
- The computation of FCF should be consistent with that of ROIC. Free cash flow begins with NOPLAT, adds depreciation, and subtracts investments in invested capital.

Home Depot: Projected Free Cash Flow

\$ million

	Historical			Forecast			
	2006	2007	2008	2009	2010	2011	
NOPLAT	6,245	4,456	3,033	2,971	3,269	3,780	} Gross Cash Flow
Depreciation	1,645	1,693	1,785	1,639	1,685	1,778	
Gross cash flow	7,890	6,149	4,818	4,610	4,954	5,558	
Change in operating working capital	(936)	(739)	–	292	(73)	(163)	} Investments in Invested Capital
Net capital expenditures	(3,349)	(3,577)	(543)	503	(2,355)	(3,151)	
Decrease (increase) in capitalized operating leases	(1,214)	1,262	(419)	678	(212)	(434)	
Investments in goodwill and acquired intangibles	(3,525)	–	175	–	–	–	
Decrease (increase) in net long-term operating assets	224	457	494	(174)	54	111	
Increase (decrease) in accumulated other comprehensive income	(99)	445	(832)	–	–	–	} NOPLAT plus depreciation, less investments in invested capital
Gross investment	(8,899)	(2,152)	(1,125)	1,299	(2,586)	(3,637)	
Free cash flow	(1,009)	3,998	3,693	5,909	2,368	1,921	

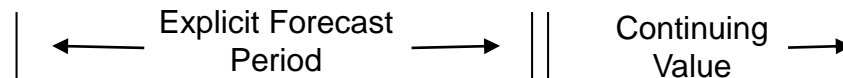
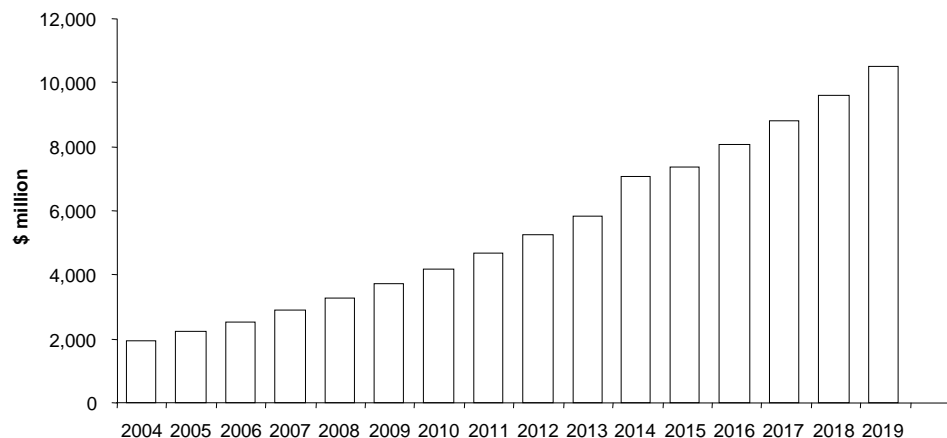
3. Continuing Value

- To estimate a company's value, we separate a company's expected cash flow into two periods and define the company's value as follows:

$$\text{Value} = \begin{array}{c} \text{Present Value of Cash Flow} \\ \text{during Explicit Forecast Period} \end{array} + \begin{array}{c} \text{Present Value of Cash Flow} \\ \text{after Explicit Forecast Period} \end{array}$$

- The second term is the continuing value: the value of the company's expected cash flow beyond the explicit forecast period.

Home Depot: Estimated Free Cash Flow



Continuing Value: The Key Value Driver Formula

- Although many continuing-value models exist, we prefer the key value driver model. The key value driver formula is superior to alternative methodologies because it is based on cash flow and links cash flow to growth and ROIC.

$$\text{Continuing Value} = \frac{\text{NOPLAT}_{t+1} \left(1 - \frac{g}{\text{ROIC}} \right)}{\text{WACC} - g}$$

For continuing value, ROIC is the return on *new* investment; return on *existing* investment is captured in NOPLAT.

$$\text{Continuing Value} = \frac{6,122 \left(1 - \frac{4.0\%}{12.2\%} \right)}{8.5\% - 4.0\%}$$

$$\text{Continuing Value} = \$91,440$$

The continuing value is measured as of 2018. This value must still be discounted to the present day.

Note: Enterprise valuation based on \$92,239 million; the precise calculation without rounding.

4. Weighted Average Cost of Capital

- When performing an enterprise DCF, make sure to choose the cash flows and discount factor consistently. Since free cash flows are the cash flows available to *all* investors, the discount factor for free cash flow must represent the risk faced by *all* investors.
- The weighted average cost of capital (WACC) blends the required rates of return for debt k_d and equity k_e based on their target market values.

Target (market-based) weights on
debt and equity

$$\text{WACC} = \frac{D}{V} k_d (1 - T_m) + \frac{E}{V} k_e$$

After-tax cost of debt After-tax cost of equity

Home Depot: Weighted Average Cost of Capital

percent					
Source of capital	Proportion of total capital	Cost of capital	Marginal tax rate	After-tax cost of capital	Contribution to weighted average
Debt	31.5	6.8	37.6	4.2	1.3
Equity	68.5	10.4		10.4	7.1
WACC	100.0				8.5

5. Putting It All Together: Enterprise DCF Valuation

Home Depot: Enterprise DCF Valuation

Forecast year	Free cash flow (\$ million)	Discount factor (@ 8.5%)	Present value of FCF (\$ million)
2009	5,909	0.922	5,448
2010	2,368	0.850	2,013
2011	1,921	0.784	1,506
2012	2,261	0.723	1,634
2013	2,854	0.666	1,902
2014	3,074	0.614	1,889
2015	3,308	0.567	1,874
2016	3,544	0.522	1,852
2017	3,783	0.482	1,822
2018	4,022	0.444	1,787
Continuing value	92,239	0.444	40,966
Present value of cash flow			62,694
Midyear adjustment factor			1.041
Value of operations			65,291
Value of excess cash			-
Value of long-term investments			361
Value of tax loss carry-forwards			112
Enterprise value			65,764
Less: Value of debt			(11,434)
Less: Value of capitalized operating leases			(8,298)
Equity value			46,032
Number of shares outstanding (December 2008)			1.7
Equity value per share			27.1

To determine the value of operations, discount free cash flow at the weighted average cost of capital.

To determine the enterprise value, add the value of nonoperating assets, such as excess cash.

To determine the equity value, subtract the value of nonequity financial claims, such as debt and capitalized operating leases.

From Enterprise to Equity Value: Nonequity Financial Claims

- Equity is a residual claimant, receiving cash flows only after the company has fulfilled its other contractual claims. In today's increasingly complex financial markets, many claimants have rights to a company's cash flow before equity holders—and they are not always easy to spot.

1. **Debt.** If available, use the market value of all outstanding debt.
2. **Unfunded retirement liabilities.** Although total shortfall is not reported on the balance sheet (only a smoothed amount is transferred to the balance sheet), the stock market values unfunded retirement liabilities as an offset against enterprise value.
3. **Operating leases.** The most common form of off-balance-sheet debt is that of operating leases. Under certain conditions, companies can avoid capitalizing leases as debt on their balance sheets (required payments must be disclosed in the footnotes).
4. **Contingent liabilities.** Most cases, operating leases represent the largest off-balance-sheet obligation. Any other material off-balance-sheet contingencies, such as lawsuits and loan guarantees, will be reported in the footnotes.

From Enterprise to Equity Value: Nonequity Financial Claims

5. **Minority interest.** When a company controls a subsidiary but does not own 100 percent, the investment must be consolidated, and the funding provided by other investors is recognized on the company's balance sheet as minority interest.
6. **Preferred stock.** Although the name denotes equity, preferred stock in well-established companies more closely resembles unsecured debt.
7. **Employee options.** Each year, many companies offer their employees compensation in the form of options. Since options give the employee the right to buy company stock at a potentially discounted price, they can have great value.

6. Calculate and Interpret Results

- **Is the Model Technically Robust?**

- In the unadjusted financial statements, the balance sheet should balance every year, both historically and in forecast years. Check that net income flows correctly into dividends paid and retained earnings.
- In the rearranged financial statements, check that the sum of invested capital plus nonoperating assets equals the cumulative sources of financing. Is net operating profit less adjusted taxes (NOPLAT) identical when calculated top-down from sales and bottom-up from net income? Does net income correctly link to dividends and retained earnings in adjusted equity?

- **Is the Model Economically Consistent?**

- *Are the patterns intended?* For example, does invested-capital turnover increase over time for sound economic reasons (economies of scale) or simply because you modeled future capital expenditures as a fixed percentage of revenues?
- *Are the patterns reasonable?* Avoid large step changes in key assumptions from one year to the next, because these will distort key ratios and could lead to false interpretations.

Economic Profit Valuation Models

- The economic profit model highlights how and when the company creates value yet leads to a valuation that is identical to that of enterprise DCF.
- Economic profit can be used to measure a company's performance in a given year. This allows you to determine when value is being created.

Frameworks for Valuation

Model	Measure	Discount factor	Assessment
Enterprise discounted cash flow	Free cash flow	Weighted average cost of capital	Works best for projects, business units, and companies that manage their capital structure to a target level.
Discounted economic profit	Economic profit	Weighted average cost of capital	Explicitly highlights when a company creates value.
Adjusted present value	Free cash flow	Unlevered cost of equity	Highlights changing capital structure more easily than WACC-based models.
Capital cash flow	Capital cash flow	Unlevered cost of equity	Compresses free cash flow and the interest tax shield in one number, making it difficult to compare operating performance among companies and over time.
Equity cash flow	Cash flow to equity	Levered cost of equity	Difficult to implement correctly because capital structure is embedded within the cash flow. Best used when valuing financial institutions.

Defining Economic Profit

- Economic profit translates size, return on capital, and cost of capital into a single measure. Economic profit equals the spread between the return on invested capital and the cost of capital times the amount of invested capital.

$$\text{Economic Profit} = \text{Invested Capital} \times (\text{ROIC} - \text{WACC})$$

- The formula for economic profit can be rearranged and defined as after-tax operating profits less a charge for the capital used by the company:

$$\text{Economic Profit} = \text{NOPLAT} - (\text{Invested Capital} \times \text{WACC})$$

- This approach shows that economic profit is similar in concept to accounting net income, but it explicitly charges a company for *all* its capital, not just the interest on its debt.

Economic Profit at Home Depot

- Consider both measures of economic profit for Home Depot. Since Home Depot had been earning returns greater than its cost of capital, its historical economic profit was positive. Following the financial crisis in 2008, this was no longer the case.
- Not every company has a positive economic profit. In fact, many companies earn an accounting profit (net income greater than zero), but can't earn their cost of capital.

Home Depot: Economic Profit Valuation

\$ million

	Historical			Forecast		
Method 1	2006	2007	2008	2009	2010	2011
Return on invested capital	15.9%	9.6%	7.9%	8.0%	9.6%	10.8%
Weighted average cost of capital	8.4%	8.2%	8.3%	8.5%	8.5%	8.5%
Economic spread	7.5%	1.4%	-0.4%	-0.4%	1.1%	2.3%
× Invested capital	39,389	46,543	38,567	37,075	34,137	35,038
Economic profit	2,950	629	(162)	(164)	383	818

Method 2

Invested capital (beginning of year)	39,389	46,543	38,567	37,075	34,137	35,038
× Weighted average cost of capital	8.4%	8.2%	8.3%	8.5%	8.5%	8.5%
Capital charge	3,295	3,827	3,195	3,135	2,886	2,962
NOPLAT	6,245	4,456	3,033	2,971	3,269	3,780
Capital charge	(3,295)	(3,827)	(3,195)	(3,135)	(2,886)	(2,962)
Economic profit	2,950	629	(162)	(164)	383	818

Discounted Economic Profit Leads to Same Results as DCF

- To demonstrate how economic profit can be used to value a company—and to demonstrate its equivalence to enterprise DCF—consider a stream of growing cash flows valued using the growing perpetuity formula,

$$\text{Value}_0 = \frac{\text{FCF}_1}{\text{WACC} - g}$$

- Using a few algebraic transformations and the assumption that the company's ROIC on new projects equals the company's current ROIC, we can transform the cash flow perpetuity into an economic-profit-based key value driver model,

$$\text{Value}_0 = \text{Invested Capital}_0 + \frac{\text{Invested Capital}_0 \times (\text{ROIC} - \text{WACC})}{\text{WACC} - g}$$

- Substituting the definition of economic profit,

$$\text{Value}_0 = \text{Invested Capital}_0 + \frac{\text{Economic Profit}_1}{\text{WACC} - g}$$

Home Depot: Economic Profit Valuation

Home Depot: Economic Profit Valuation

Year	Invested capital ¹ (\$ million)	ROIC ¹ (percent)	WACC (percent)	Economic profit (\$ million)	Discount factor (@ 8.5%)	Present value of economic profit (\$ million)
2009	37,075	8.0	8.5	(164)	0.922	(151)
2010	34,137	9.6	8.5	383	0.850	325
2011	35,038	10.8	8.5	818	0.784	641
2012	36,897	11.6	8.5	1,145	0.723	827
2013	38,900	12.3	8.5	1,487	0.666	991
2014	40,821	12.3	8.5	1,550	0.614	952
2015	42,748	12.2	8.5	1,611	0.567	913
2016	44,665	12.2	8.5	1,671	0.522	873
2017	46,568	12.2	8.5	1,731	0.482	834
2018	48,453	12.1	8.5	1,789	0.444	795
Continuing value				41,922	0.444	18,619
Present value of economic profit						25,619
Invested capital in 2008						37,075
Invested capital plus present value of economic profit						62,694
Midyear adjustment factor						1.041
Value of operations						65,291

Valuation using economic profit leads to the same value as enterprise DCF!

The value of operations equals:

the sum of discounted economic profit

+

current invested capital

¹Invested capital is measured at the beginning of the year.